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(54) Safety device in a drill chuck

(57) A drill chuck, more particularly for impact drilling, has a number of clamping jaws 2 actuated by a threaded ring 3 with a pressed on clamping ring 4. An annular space 12 is formed between the threaded ring 3, the body 1 of the drill chuck and the

clamping sleeve 4, and an inwardly acting spring clip 5 is disposed in such annular space 12 to normally maintain gap 9 between faces 10, 11 of the ring 3 and body 1. When the chuck key clamps jaws 2 onto the workpiece, gap 9 disappears and the spring clip 5 serves to maintain the sleeve 4, ring 3 and body 1 in this relative position during impact drilling.

Fig. 1

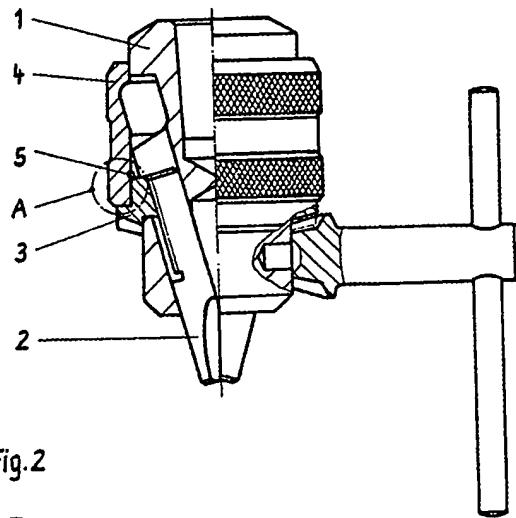
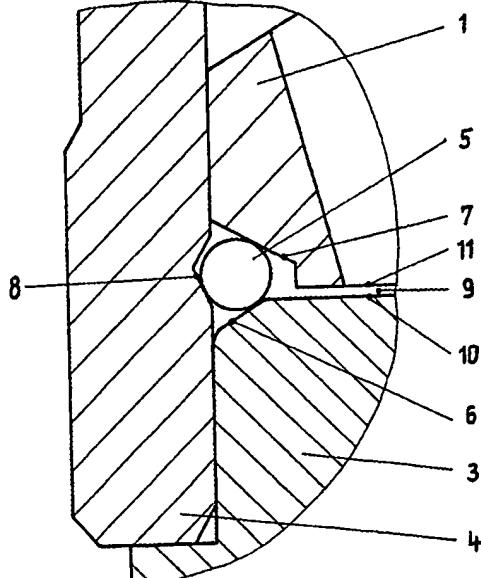


Fig. 2



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Fig. 1

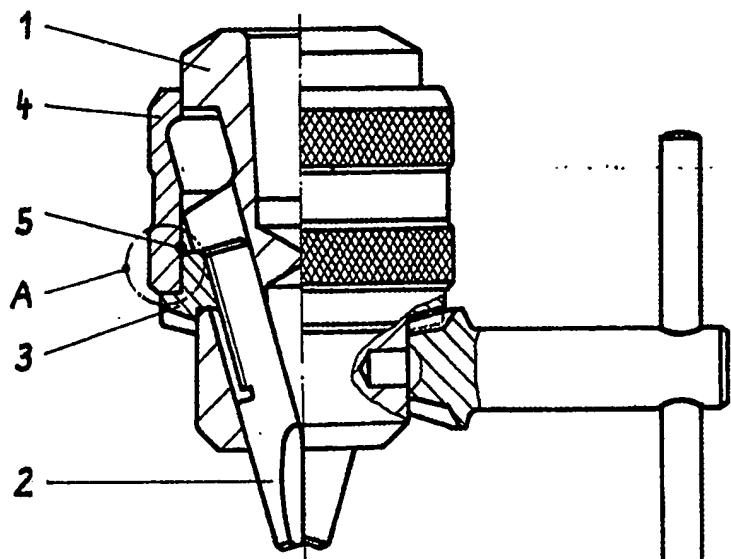
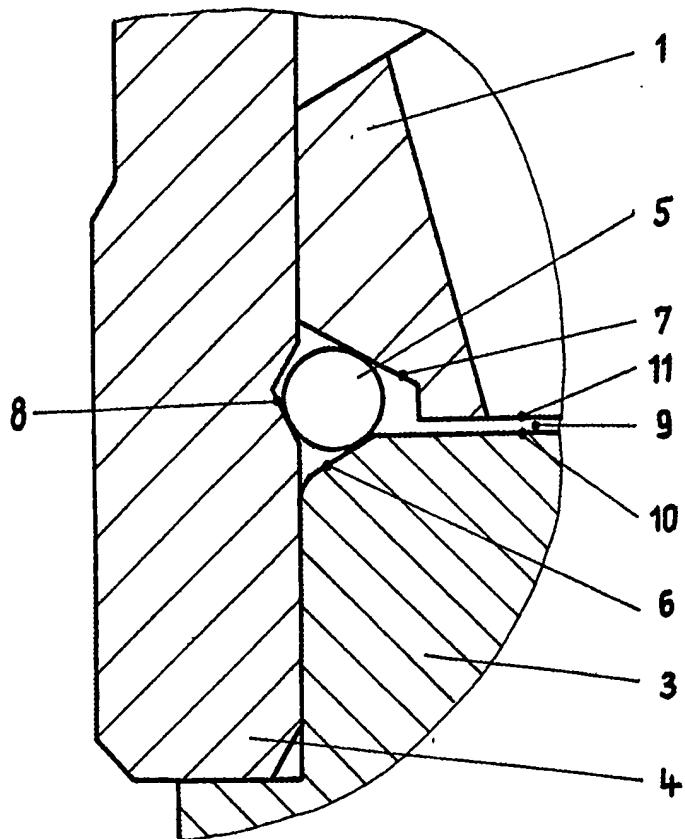


Fig. 2



SPECIFICATION
Safety device for a drill chuck

The invention relates to a safety device for a drill chuck of the type having a number of clamping jaws disposed in the body of the drill chuck which are inclined to the central axis of the chuck and can be moved longitudinally by a threaded ring having a toothed rim. The invention finds particular application in a drill chuck for impact drilling.

In drill chucks of the type specified the threaded ring, which for reasons of assembly is usually divided — i.e., consists of two ring halves — and has a toothed rim, is housed in an annular recess in the outer surface of the body of the drill chuck, and is held together with a clamping sleeve which acts as a ferrule and also serves as a clamping member.

In such drill chucks having a toothed rim, a press connection retains the clamping sleeve on the threaded ring, simultaneously securing the two parts against twisting and axial displacement, the threaded ring being axially pressed into the clamping sleeve.

In practical operation it has been found that such a press connection between the threaded ring and the clamping sleeve is sometimes inadequate to reliably absorb the working stresses occurring in the form of vibrations and jarring blows. This is particularly the case with heavy drilling, and even more so with impact drilling. Consequently, the two parts may become loosened from one another. On the one hand the clamping sleeve and threaded ring may be displaced axially in relation to one another, while on the other hand the threaded connection between the threaded ring and the clamping jaws of the drill chuck may slacken.

The effect of both kinds of inadequately rigid connection between the threaded ring and the clamping sleeve is that the functioning of such drill chucks may deteriorate to such an extent that the tool held in the drill chuck is no longer firmly or reliably clamped. The consequences of such inadequate tool clamping during practical drilling are obvious.

In order to prevent axial loosening and the consequent displacement of the clamping sleeve in relation to the threaded ring, it is already known in drill chuck manufacture to dispose between these two parts of the construction a securing pin or a spring clip as an axial securing element (US Patent Specification 14 17 981, German Patent Specification 824 287).

It has also been proposed to provide an adhesive connection between the clamping sleeve and the threaded ring. To this end groove-like recesses are formed opposite one another in opposite mating areas of the clamping sleeve and the threaded ring. Before the parts are pressed together, the recesses are filled with adhesive, the result being a compact securing ring when the adhesive has hardened.

The connection produced in this way is meant to render it impossible for the press fit between the clamping sleeve and the threaded ring to become slackened, even under heavy working loads (German Patent Specification A/S 12 55 450).

These prior art systems for securing the connection between the clamping sleeve and the threaded ring operate exclusively in the axial direction, thus counteracting any axial displacement of the parts in relation to one another.

These securing means are not intended to counteract slackening between the threaded ring and the clamping jaws of the drill chuck and the resulting slackening of drilling tool clamping, so that they are unsuitable for impact drilling.

If in drill chucks of the type specified a suitable safety device is to be provided against the twisting of the clamping sleeve in relation to the clamping jaws, such as is indispensable in impact drilling in order to maintain the tool clamping by the drill chuck clamping jaws, a further, second safety device must be incorporated.

To prevent the threaded ring from becoming slackened on or in relation to the clamping jaws, therefore, it has been suggested for the impact drilling operation of such drill chucks that there should be provided on the body of the drill chuck a locknut which operates against the clamping sleeve and which, on completion of the clamping operation carried out by means of the drill chuck key, is tightened against the clamping sleeve (German Democratic Republic Patent Specification 131 141).

Quite apart from the fact that this safety device deals only inadequately with the problem of the threaded ring becoming slackened in relation to the clamping jaws, the fact is that two separately disposed securing means, operating independently of one another, must be used to secure these constructional elements as satisfactorily as possible against axial displacement of the clamping sleeve on the threaded ring, and against the slackening of the threaded ring on the clamping jaws. This causes increased manufacturing costs and is also inconvenient as regards the behaviour of such drill chucks when used, since the incorporation of two safety devices makes it a complicated matter to handle such clamping devices.

The aim of the present invention is to reduce the cost of manufacturing such safety devices and to perfect the practical properties of such drill chucks equipped with safety devices.

The problem to which the invention relates is to use only one technical means to satisfy both safety demands made on such drill chucks, namely to prevent any axial displacement of the clamping sleeve on the threaded ring and also to prevent the slackening of the threaded ring on or in relation to the clamping jaws of drill chucks of the type specified.

To this end according to the invention an annular space, bounded by outwardly diverging surfaces of rotation on the threaded ring and the

body of the drill chuck and also by an annular groove in the clamping sleeve, is disposed between the threaded ring, the body of the drill chuck and the clamping sleeve, and a preferably 5 inwardly operating spring clip is disposed to the annular space.

Preferably, the annular groove in the clamping sleeve is a V-shaped machined groove. This is a 10 very advantageous feature for the mounting and 15 more particularly the demounting of the clamping sleeve, for example, in order to interchange worn clamping jaws.

The safety device according to the invention has in the first place the advantages over prior art 15 devices for this purpose that both safety demands, as described hereinbefore, are met by a single securing or securing arrangement which serves both 20 securing purposes, while at the same time such securing arrangement can be relatively simply manufactured at a relatively low cost.

In addition to these advantages the safety device according to the invention has a 25 considerable securing effect which is the result of both the axial securing of the clamping sleeve and also of the reliable maintenance of the clamping 30 between the threaded ring and the clamping jaws of the drill chuck.

Another advantage achieved by the invention is 35 that the double securing effect is constrainedly achieved when the drill chuck is operated. The fact is that the clamping of the drilling tool in the drill chuck, using the drill chuck key, produces a mutual tensioning of the securing elements, comprising the wedge-like-acting areas on the 40 threaded ring, the body of the drill chuck and the clamping sleeve in conjunction with the spring clip disposed therebetween, to which end the play of movement existing between the body of the drill chuck and the threaded ring is conveniently utilized.

Since such tensioning of the safety elements lies in the zone of self-locking of the wedge-shaped surfaces on the constructional parts, it is 45 impossible for the threaded ring to become slackened or the clamping sleeve axially displaced; this is in accordance with the aim of the invention. As a result, the demand for a high degree of reliability of the clamping condition of the drill 50 chuck is met even during heavy drilling or impact drilling.

To help understanding of the invention, a specific embodiment thereof will now be described in greater detail with reference to the accompanying drawings in which:—

55 Figure 1 is a front elevation partly in section of a drill chuck incorporating a safety device of the invention, and

Figure 2 shows detail A of Figure 1.

Guided in known manner in the body 1 of a drill 60 chuck, which is connected via a suitable holder to

a drilling machine spindle (not shown), are clamping jaws 2, which are inclined in relation to the central axis of the body of the drill chuck and are operatively connected by means of a threaded member to a threaded ring 3 having a toothed rim. The threaded ring 3 is guided in known manner in an annular recess in the body 1 of the drill chuck. For assembly purposes, the threaded ring, consisting of two halves, is held together by a 65 pressed-on clamping sleeve 4 after it has been inserted in the annular recess in the body of the drill chuck. Machined on the threaded ring 3 and the body 1 of the drill chuck are respective surfaces of rotation 6, 7 which diverge outwardly 70 and co-operate with an annular groove 8 machined in the clamping sleeve 4 to form an annular space 12.

Inserted in the annular space 12 is a circular spring clip 5 which operates inwards. The force of 80 the spring clip 5 keeps flat area 10 on the threaded ring 3 and flat area 11 on the body 1 of the drill chuck away from one another, utilizing a clearance partly due to manufacture, until the effect of the clamping force brought about by 85 means of the drill chuck key brings the clamping jaws to bear against the drilling tool to be clamped, the effect of the clamping force being to close the longitudinal gap 9 and tension the spring clip 5 between the threaded ring 3, the body 1 of 90 the drill chuck and the clamping sleeve 4.

In this position of the securing elements the safety device is in the operative position.

CLAIMS

1. A safety device for a drill chuck, having a 95 number of clamping jaws disposed in the body of the drill chuck which are inclined to the central axis of the chuck and can be moved longitudinally by a threaded ring having a toothed rim and a clamping sleeve attached to the threaded ring, the

100 safety device comprising an annular space bounded by respective outwardly diverging surfaces of rotation on the threaded ring and the body of the drill chuck and also by an annular groove in the clamping sleeve, and disposed 105 between the threaded ring, the body of the drill chuck and the clamping sleeve, and a spring clip disposed in the annular space.

2. A safety device as claimed in Claim 1, wherein that the annular groove in the clamping 110 sleeve is a V-shaped machined groove.

3. A safety device as claimed in Claim 1 or Claim 2, wherein there is a longitudinal gap between the body of the drill chuck and the threaded ring when the drill chuck is in the 115 unclamped condition.

4. A safety device as claimed in Claim 1, Claim 2 or Claim 3 wherein the spring ring is inwardly operating and is forced outwards by the

diverging surfaces into the annular groove in the clamping sleeve when a tool is clamped in the drill chuck.

5. A safety device substantially as hereinbefore described with reference to the accompanying drawings.

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